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(54) PRODUCTION OF METAL CARRIER

(57)Abstract:

PURPOSE: To provide a production method of a metal carrier having durability for practical use by stably performing diffusion joining of a flat foil and a corrugated foil of the metal carrier and diffusion joining of an outer cylinder and a honeycomb body.

CONSTITUTION: In the process of diffusion joining between a flat foil and a corrugated foil of a metal carrier and diffusion joining between an outer cylinder and a honeycomb body, the surface roughness of the foils and the inner wall of the outer cylinder is specified to 0.001-0.1μm average roughness (Ra). Thereby, diffusion joining can excellently and stably be performed. Further, by using a corrugated foil having ≥30μm contact width with a flat foil, diffusion joining can be more stabilized.

LAIMS

[Claim(s)]
[Claim 1] The flat foil of the metallic foil made from a heat-resistant alloy. the wave foil which carried out corrugated processing and formed this foil -- in piles -- ****** -- or the constituted honeycomb object which carried out the laminating by turns The outer case made from a heat-resistant alloy which holds it. It is the manufacture method of the metal support equipped with the above, and it is characterized by setting surface roughness of this metallic foil to 0.001 micrometers or more 0.2 micrometers or less by the average of roughness height (Ra) in performing junction of the flat foil and wave foil of a honeycomb object by diffused junction.
[Claim 2] The manufacture method of the metal support according to claim 1 using the wave foil of the configuration from which the contact width of face of the aforementioned flat foil and a wave foil is set to 30 micrometers or more in joining a honeycomb object by diffused junction.
[Claim 3] The manufacture method of the metal support according to claim 1 or 2 which sets surface roughness of the aforementioned outer case inside to 0.001 micrometers or more 0.2 micrometers or less by the average of roughness height (Ra) in performing junction between a honeycomb object and an outer case by diffused junction.
[Claim 4] The manufacture method of the metal support according to claim 1, 2, or 3 whose diameter is reduced with an outer case after positioning by inserting a honeycomb object in an outer case.
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the manufacture method of the metal support for catalytic converters for purifying the exhaust gas discharged from internal combustion engines, such as an engine of an automobile, especially the metal support by diffused junction.
[0002] Although ceramic support is used for the catalytic converter for purifying the exhaust gas of an automobile conventionally, the amount of the metal support used is increasing recently from the point of thermal resistance, low voltage loss, and loading nature.
[0003] Although it shows the appearance to drawing 1 , the metal support 1 winds in piles the flat foil 2 of the metallic foil of anticorrosion, such as stainless steel with a thickness of about 50 micrometers, and the product made from a heat-resistant alloy, and the wave foil 3 which carried out corrugated processing of the flat foil, or the laminating of it is carried out mutually and it forms the honeycomb object 4, contains the honeycomb object 4 in an outer case 5, and is formed. And after this metal support 1 has a catalyst for exhaust gas purification of platinum, palladium, a rhodium, etc. supported, it is carried in the exhaust gas system of an automobile engine.
[0004] In order that this metal support 1 may receive the intense vibration from the intense heat cycle by the hot exhaust gas of an engine, or an engine, importance is

attached to endurance. Then, in order to secure endurance, junction to the flat foil 2 of the honeycomb object 4 and a wave foil 3 and junction in the honeycomb object 4 and an outer case 5 have been performed for the metal support 1 by low attachment, resistance welding, or diffused junction from the former.

[0005] Diffused junction here is the method of joining by holding under an elevated-temperature high vacuum or a non-oxidizing atmosphere, without using low material etc. specially. When carrying out diffused junction, it is important to secure the contact section of the flat foil 2 for the method of joining the mutual contact section and a wave foil 3.

[0006] In the conventional diffused junction, raising the contact pressure between a flat foil 2 and a wave foil 3 as a method of securing the contact section of a flat foil 2 and a wave foil 3 has been mentioned. That is, at the time of formation of the honeycomb object 4, the back tension was hung in the direction of Arrow A like drawing 2 at the flat foil 2, and it rolled round in the direction of Arrow B with the wave foil 3, it wound around the surroundings of a shaft 6, and the honeycomb object 4 was wound up firmly. Furthermore, after doing so and inserting the made honeycomb object 4 in an outer case 5, elevated-temperature heat treatment was carried out under the high vacuum or the non-oxidizing atmosphere, and the metal support 1 has been manufactured.

[0007] However, it rolled round, when the load of the back tension of a required value was carried out to the diffused-junction assembly of the honeycomb object 4 on calculation and a flat foil 2 and a wave foil 3 were rolled round, the shaft deformed, or when the back tension overemphasized, the flat foil 2 fractured and the problem of becoming winding impotentia occurred. Then, in order to stop and roll round a back tension, as shown in JP,2-14747,A, after inserting the honeycomb object 4 in an outer case 5, the method of reducing the diameter for a dice and raising contact pressure from the outer layer section with an outer case 5, was tried. However, in diameter reduction, buckling of a wave foil 3 occurred in part with deformation, and since it was not that whose diameter can be reduced without any restriction, sufficient effect was not acquired.

[0008]

[Problem(s) to be Solved by the Invention] After winding this invention around the surroundings of a medial axis with the wave foil which carried out corrugated processing of the flat foil, forming a honeycomb object, inserting this honeycomb object in an outer case and reducing the diameter of it in one, giving a back tension to a flat foil, it solves the problem to which junction of the flat foil and wave foil of a honeycomb object and junction of a honeycomb object and an outer case become unstable in the manufacture method of the metal support which carries out diffused junction under a vacuum or a non-oxidizing atmosphere.

[0009]

[Means for Solving the Problem] The honeycomb object by which the summary of this invention wound in piles the flat foil of the metallic foil of (1) heat-resistant-alloy nature, and the wave foil formed by carrying out corrugated processing of this foil, or the laminating was carried out by turns, In the manufacture method of the metal support for catalytic converters which consists of an outer case made from a heat-resistant alloy which holds it The manufacture method of the metal support which sets

surface roughness of this metallic foil to 0.001 micrometers or more 0.2 micrometers or less by the average of roughness height (Ra) in performing junction of the flat foil and wave foil of a honeycomb object by diffused junction, [0010] (2) a honeycomb -- the body -- junction -- diffused junction -- carrying out -- hitting -- a flat foil -- a wave foil -- contact -- width of face -- 30 -- micrometer -- more than -- becoming -- a configuration -- a wave foil -- using -- (-- one --) -- a publication -- metal -- support -- manufacture -- a method -- (3) (1) which sets surface roughness of the inside of this outer case to 0.001 micrometers or more 0.2 micrometers or less by the average of roughness height (Ra) in performing junction between a honeycomb object and an outer case by diffused junction, or the manufacture method of metal support given in (2), (4) It is in the manufacture method of the metal support of (1), (2), or (3) publications whose diameter is reduced with an outer case, after positioning by inserting a honeycomb object in an outer case.

[0011]

[Function] When carrying out diffused junction of the metallic foils with a thickness of about 50 micrometers which constitutes the honeycomb object used by the metal support for catalytic converters, or when carrying out diffused junction of the outer case to the aforementioned honeycomb object, the materials which should be joined must be stuck mutually.

[0012] A pressurizer or a wait is used so that planar pressure may generally join the material which should be joined from beginning to end also during heating junction in diffused junction. However, in the case of metal support, based on the singularity of the structure, planar pressure cannot be given from the exterior, but in order to form a honeycomb object, it is necessary to carry out diffused junction under the limited planar pressure obtained by the diameter reduction after inserting in an outer case the limited back tension or limited honeycomb object of tension which applies metallic foils to a flat foil at the time of ******.

[0013] As a result of searching for the method of raising diffused-junction nature under the same planar pressure, it discovered that it was effective to make small surface roughness of a flat foil and a wave foil in the diffused-junction assembly of a honeycomb object. According to the experimental result, the good diffused-junction section was obtained for the average of roughness height (Ra) of a flat foil and a wave foil very easily by 0.001 micrometers or more 0.2 micrometers or less. In addition, the minimum of the average of roughness height of a metallic foil has desirable 0.001 micrometers. Even if it makes the reason smooth more than it, the influence which it has on diffused-junction nature is because it is saturated. Furthermore, when the average of roughness height (Ra) of an outer case inside was 0.001 micrometers or more 0.2 micrometers or less, it checked that the diffused junction of a honeycomb object and outer case material advanced easily. Moreover, while making surface roughness of the flat foil of this invention, and a wave foil into the aforementioned range, when contact width of face of a flat foil and a wave foil is set to 30 micrometers or more for the configuration of a wave foil like for example, a trapezoidal-wave foil, diffused-junction nature improves more and is desirable.

[0014]

[Example] Metal support with an outer diameter [of 100mm] and a length of 100mm compared the case where it was based on the conventional metal support

manufacture method and a conventional this invention. The following is the common specifications of the metal support by the conventional method and this invention. flat foil: -- 50 micrometers in a ferrite system stainless steel foil and thickness, width-of-face wave foil [of 100mm]:ferrite system stainless steel foil, thickness [of 50 micrometers], wave height [of 1.25mm], and pitch 2.54mm and width-of-face [of 100mm] outer case:heatproof stainless steel, 1.5mm of board thickness, the product outer diameter of 100mm, and a length [0015] of 100mm (1) The metal support I flat foil and wave foil by the conventional method : they are 15kgf(s) to contact width-of-face:200-micrometer outer case:quality-of-the-material 18Cr-8nickel of quality-of-the-material 20Cr-5aluminum, a surface roughness (Ra) 0.3-micrometer flat foil, and a wave foil, and a surface roughness (Ra) 0.3-micrometer flat foil. Adding a back tension, it wound with the wave foil and the honeycomb object with an outer diameter of 98.5mm was created. The honeycomb object was inserted in the outer diameter of 102mm, and the outer case of 1.5mm of board thickness, and the diameter was reduced in outer diameter of 100mm with the diameter reduction machine. Then, heating maintenance was carried out for 90 minutes under the elevated-temperature high vacuum of 1250 degrees C and 10-4torr, and the metal support I was manufactured.

[0016] (2) The metal support II flat foil and wave foil by this invention method : they are 15kgf(s) to contact width-of-face:200-micrometer outer case:quality-of-the-material 18Cr-8nickel of quality-of-the-material 20Cr-5aluminum, a surface roughness (Ra) 0.2-micrometer flat foil, and a wave foil, and a surface roughness (Ra) 0.2-micrometer flat foil. Adding a back tension, it wound with the wave foil and the honeycomb object with an outer diameter of 98.5mm was created. The honeycomb object was inserted in the outer diameter of 102mm, and the outer case of 1.5mm of board thickness, and the diameter was reduced in outer diameter of 100mm with the diameter reduction machine. Then, heating maintenance was carried out for 90 minutes under the elevated-temperature high vacuum of 1250 degrees C and 10-4torr, and the metal support II was manufactured.

[0017] (3) The metal support III flat foil and wave foil by this invention method : they are 15kgf(s) to contact width-of-face:200-micrometer outer case:quality-of-the-material 18Cr-8nickel of quality-of-the-material 20Cr-5aluminum, a surface roughness (Ra) 0.1-micrometer flat foil, and a wave foil, and a surface roughness (Ra) 0.1-micrometer flat foil. Adding a back tension, it wound with the wave foil and the honeycomb object with an outer diameter of 98.5mm was created. The honeycomb object was inserted in the outer diameter of 102mm, and the outer case of 1.5mm of board thickness, and the diameter was reduced in outer diameter of 100mm with the diameter reduction machine. Then, heating maintenance is carried out for 90 minutes under the elevated-temperature high vacuum of 1250 degrees C and 10-4torr, and it is the metal support III. It manufactured.

[0018] (4) The metal support IV flat foil and wave foil by this invention method : they are 15kgf(s) to contact width-of-face:200-micrometer outer case:quality-of-the-material 18Cr-8nickel of quality-of-the-material 20Cr-5aluminum, a surface roughness (Ra) 0.01-micrometer flat foil, and a wave foil, and a surface roughness (Ra) 0.05-micrometer flat foil. Adding a back tension, it wound with the wave foil and the honeycomb object with an outer diameter of 98.5mm was created.

The honeycomb object was inserted in the outer diameter of 102mm, and the outer case of 1.5mm of board thickness, and the diameter was reduced in outer diameter of 100mm with the diameter reduction machine. Then, heating maintenance was carried out for 90 minutes under the elevated-temperature high vacuum of 1250 degrees C and 10-4torr, and the metal support IV was manufactured.

[0019] (5) The metal support V flat foil and wave foil by this invention method : they are 15kgf(s) to contact width-of-face:200-micrometer outer case:quality-of-the-material 18Cr-8nickel of quality-of-the-material 20Cr-5aluminum, a surface roughness (Ra) 0.001-micrometer flat foil, and a wave foil, and a surface roughness (Ra) 0.01-micrometer flat foil. Adding a back tension, it wound with the wave foil and the honeycomb object with an outer diameter of 98.5mm was created.

The honeycomb object was inserted in the outer diameter of 102mm, and the outer case of 1.5mm of board thickness, and the diameter was reduced in outer diameter of 100mm with the diameter reduction machine. Then, heating maintenance was carried out for 90 minutes under the elevated-temperature high vacuum of 1250 degrees C and 10-4torr, and the metal support V was manufactured.

[0020] (6) The metal support VI flat foil and wave foil by this invention method : they are 15kgf(s) to contact width-of-face:30-micrometer outer case:quality-of-the-material 18Cr-8nickel of quality-of-the-material 20Cr-5aluminum, a surface roughness (Ra) 0.1-micrometer flat foil, and a wave foil, and a surface roughness (Ra) 0.1-micrometer flat foil. Adding a back tension, it wound with the wave foil and the honeycomb object with an outer diameter of 98.5mm was created. The honeycomb object was inserted in the outer diameter of 102mm, and the outer case of 1.5mm of board thickness, and the diameter was reduced in outer diameter of 100mm with the diameter reduction machine. Then, heating maintenance was carried out for 90 minutes under the elevated-temperature high vacuum of 1250 degrees C and 10-4torr, and the metal support VI was manufactured.

[0021] (7) The metal support VII flat foil and wave foil by the conventional method : they are 15kgf(s) to contact width-of-face:20-micrometer outer case:quality-of-the-material 18Cr-8nickel of quality-of-the-material 20Cr-5aluminum, a surface roughness (Ra) 0.1-micrometer flat foil, and a wave foil, and a surface roughness (Ra) 0.3-micrometer flat foil. Adding a back tension, it wound with the wave foil and the honeycomb object with an outer diameter of 98.5mm was created. The honeycomb object was inserted in the outer diameter of 102mm, and the outer case of 1.5mm of board thickness, and the diameter was reduced in outer diameter of 100mm with the diameter reduction machine. Then, heating maintenance is carried out for 90 minutes under the elevated-temperature high vacuum of 1250 degrees C and 10-4torr, and it is the metal support VII. It manufactured.

[0022] The above-mentioned metal support I, II, and III, IV, and V were embedded to the resin, and the rate of junction of the honeycomb object for 20 layers was investigated from the periphery after polish. The result is shown in Table 1. Furthermore, the rate of junction of a honeycomb object and an outer case was investigated. The result is shown in Table 2. To the conventional method, it was able to be stabilized, diffused junction could be performed according to the method of this invention, and good diffused-junction metal support was able to be obtained.

[0023] The above-mentioned metal support III, VI, and VII It cut and the peel test of a flat foil and a wave foil was performed (a peel test is the simple measuring method of the rate of junction of a flat foil and a wave foil, tore off the foil on cutting pliers, and considered as success what separated what separated from the junction in the base material sections other than a defect and a junction). Consequently, it fractures by the flat foil, leaving the diffused-junction section in III of this invention, and VI, and is VII of a conventional method. It set and fractured in the diffused-junction section. To the conventional method, it was able to be stabilized, diffused junction could be performed according to the method of this invention, and good diffused-junction metal support was able to be obtained.
[0024] The diffused-junction metal support II and III by this invention, and IV, V and VI were carried in the exhaust air system of a gasoline engine, and when 900 cycles of durability tests for 150 degrees-C x 10 minutes of 900 degrees-C x 10-minute + cooling of heating [1 cycle :] were carried out, it passed altogether.
[0025]
[Table 1]

[0026]
[Table 2]

[0027]
[Effect of the Invention] Since diffused junction of the flat foil and wave foil of metal support and diffused junction of an outer case and a honeycomb object can be performed good as mentioned above according to this invention, the metal support which is equal to practical use can be manufactured.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective diagram showing metal support.
[Drawing 2] It is the perspective diagram showing the winding state of a honeycomb object.
[Description of Notations]
1 -- Metal support
2 -- Flat foil
3 -- Wave foil
4 -- Honeycomb object
5 -- Outer case
6 -- Winding shaft
A -- Arrow which shows the direction of a back tension
B -- Arrow which shows the direction of honeycomb object winding.

ECHNICAL FIELD

[Industrial Application] this invention relates to the manufacture method of the metal support for catalytic converters for purifying the exhaust gas discharged from internal combustion engines, such as an engine of an automobile, especially the metal support by diffused junction.

[0002] Although ceramic support is used for the catalytic converter for purifying the exhaust gas of an automobile conventionally, the amount of the metal support used is increasing recently from the point of thermal resistance, low voltage loss, and loading nature.

[0003] Although it shows the appearance to drawing 1 , the metal support 1 winds in piles the flat foil 2 of the metallic foil of anticorrosion, such as stainless steel with a thickness of about 50 micrometers, and the product made from a heat-resistant alloy, and the wave foil 3 which carried out corrugated processing of the flat foil, or the laminating of it is carried out mutually and it forms the honeycomb object 4, contains the honeycomb object 4 in an outer case 5, and is formed. And after this metal support 1 has a catalyst for exhaust gas purification of platinum, palladium, a rhodium, etc. supported, it is carried in the exhaust gas system of an automobile engine.

[0004] In order that this metal support 1 may receive the intense vibration from the intense heat cycle by the hot exhaust gas of an engine, or an engine, importance is attached to endurance. Then, in order to secure endurance, junction to the flat foil 2 of the honeycomb object 4 and a wave foil 3 and junction in the honeycomb object 4 and an outer case 5 have been performed for the metal support 1 by low attachment, resistance welding, or diffused junction from the former.

[0005] Diffused junction here is the method of joining by holding under an elevated-temperature high vacuum or a non-oxidizing atmosphere, without using low material etc. specially. When carrying out diffused junction, it is important to secure the contact section of the flat foil 2 for the method of joining the mutual contact section and a wave foil 3.

[0006] In the conventional diffused junction, raising the contact pressure between a flat foil 2 and a wave foil 3 as a method of securing the contact section of a flat foil 2 and a wave foil 3 has been mentioned. That is, at the time of formation of the honeycomb object 4, the back tension was hung in the direction of Arrow A like drawing 2 at the flat foil 2, and it rolled round in the direction of Arrow B with the wave foil 3, it wound around the surroundings of a shaft 6, and the honeycomb object 4 was wound up firmly. Furthermore, after doing so and inserting the made honeycomb object 4 in an outer case 5, elevated-temperature heat treatment was carried out under the high vacuum or the non-oxidizing atmosphere, and the metal support 1 has been manufactured.

[0007] However, it rolled round, when the load of the back tension of a required value was carried out to the diffused-junction assembly of the honeycomb object 4 on calculation and a flat foil 2 and a wave foil 3 were rolled round, the shaft deformed, or when the back tension overemphasized, the flat foil 2 fractured and the problem of becoming winding impotentia occurred. Then, in order to stop and roll round a back tension, as shown in JP,2-14747,A, after inserting the honeycomb object 4 in an outer case 5, the method of reducing the diameter for a dice and raising contact pressure from the outer layer section with an outer case 5, was tried. However, in diameter

reduction, buckling of a wave foil 3 occurred in part with deformation, and since it was not that whose diameter can be reduced without any restriction, sufficient effect was not acquired.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] After winding this invention around the surroundings of a medial axis with the wave foil which carried out corrugated processing of the flat foil, forming a honeycomb object, inserting this honeycomb object in an outer case and reducing the diameter of it in one, giving a back tension to a flat foil, it solves the problem to which junction of the flat foil and wave foil of a honeycomb object and junction of a honeycomb object and an outer case become unstable in the manufacture method of the metal support which carries out diffused junction under a vacuum or a non-oxidizing atmosphere.

EFFECT OF THE INVENTION

[Effect of the Invention] Since diffused junction of the flat foil and wave foil of metal support and diffused junction of an outer case and a honeycomb object can be performed good as mentioned above according to this invention, the metal support which is equal to practical use can be manufactured.

MEANS

[Means for Solving the Problem] The honeycomb object by which the summary of this invention wound in piles the flat foil of the metallic foil of (1) heat-resistant-alloy nature, and the wave foil formed by carrying out corrugated processing of this foil, or the laminating was carried out by turns, The manufacture method of the metal support which sets surface roughness of this metallic foil to 0.001 micrometers or more 0.2 micrometers or less by the average of roughness height (Ra) in the manufacture method of the metal support for catalytic converters which consists of an outer case made from a heat-resistant alloy which holds it in performing junction of the flat foil and wave foil of a honeycomb object by diffused junction, [0010] (2) a honeycomb -- the body -- junction -- diffused junction -- carrying out -- hitting -- a flat foil -- a wave foil -- contact -- width of face -- 30 -- micrometer -- more than -- becoming -- a configuration -- a wave foil -- using -- (-- one --) -- a publication -- metal -- support -- manufacture -- a method -- (3) (1) which sets surface roughness of the inside of this outer case to 0.001 micrometers or more 0.2 micrometers or less by the average of roughness height (Ra) in performing junction between a honeycomb object and an outer case by diffused junction, or the manufacture method of metal support given in (2), (4) It is in the manufacture method of the metal support of (1), (2), or (3) publications whose diameter is reduced with an outer case, after positioning by inserting a honeycomb object in an outer case.

OPERATION

[Function] When carrying out diffused junction of the metallic foils with a thickness of about 50 micrometers which constitutes the honeycomb object used by the metal support for catalytic converters, or when carrying out diffused junction of the outer case to the aforementioned honeycomb object, the materials which should be joined must be stuck mutually.

[0012] A pressurizer or a wait is used so that planar pressure may generally join the material which should be joined from beginning to end also during heating junction in diffused junction. However, in the case of metal support, based on the singularity of the structure, planar pressure cannot be given from the exterior, but in order to form a honeycomb object, it is necessary to carry out diffused junction under the limited planar pressure obtained by the diameter reduction after inserting in an outer case the limited back tension or limited honeycomb object of tension which applies metallic foils to a flat foil at the time of ******.

[0013] As a result of searching for the method of raising diffused-junction nature under the same planar pressure, it discovered that it was effective to make small surface roughness of a flat foil and a wave foil in the diffused-junction assembly of a honeycomb object. According to the experimental result, the good diffused-junction section was obtained for the average of roughness height (Ra) of a flat foil and a wave foil very easily by 0.001 micrometers or more 0.2 micrometers or less. In addition, the minimum of the average of roughness height of a metallic foil has desirable 0.001 micrometers. Even if it makes the reason smooth more than it, the influence which it has on diffused-junction nature is because it is saturated. Furthermore, when the average of roughness height (Ra) of an outer case inside was 0.001 micrometers or more 0.2 micrometers or less, it checked that the diffused junction of a honeycomb object and outer case material advanced easily. Moreover, while making surface roughness of the flat foil of this invention, and a wave foil into the aforementioned range, when contact width of face of a flat foil and a wave foil is set to 30 micrometers or more for the configuration of a wave foil like for example, a trapezoidal-wave foil, diffused-junction nature improves more and is desirable.

[Translation done.]

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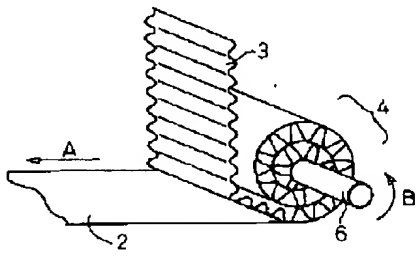
(54) **PRODUCTION OF METAL CARRIER**

(57) Abstract:

PURPOSE: To provide a production method of a metal carrier having durability for practical use by stably performing diffusion joining of a flat foil and a corrugated foil of the metal carrier and diffusion joining of an outer cylinder and a honeycomb body.

CONSTITUTION: In the process of diffusion joining between a flat foil and a corrugated foil of a metal carrier and diffusion joining between an outer cylinder and a honeycomb body, the surface roughness of the foils and the inner wall of the outer cylinder is specified to 0.001-0.1μm average roughness (Ra). Thereby, diffusion joining can excellently and stably be performed. Further, by using a corrugated foil having ³30μm contact width with a flat foil, diffusion joining can be more stabilized.



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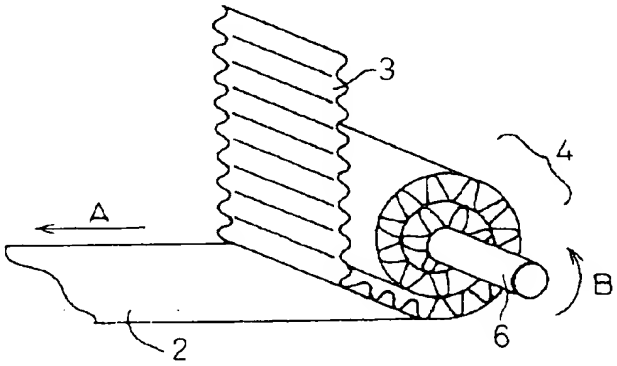
(54)【発明の名称】　メタル担体の製造方法

(57)【要約】
【目的】　メタル担体の平箔と波箔の拡散接合および外筒とハニカム体の拡散接合を安定に行い、実用に耐えるメタル担体を製造する方法を提供することを目的とする。
【構成】　メタル担体の平箔と波箔の拡散接合および外筒とハニカム体の拡散接合において、箔および外筒内面の表面粗さを平均粗さ（Ｒａ）で０．１μｍ以下とする。これにより拡散接合を良好にかつ安定して行うことができる。さらに、平箔と波箔の接触幅を３０μｍ以上とする波箔を用いることで拡散接合をより安定化せしめる。



6…巻取り軸
A…バックテンションの方向を示す矢印
B…ハニカム体巻取り方向を示す矢印

1

【特許請求の範囲】

【請求項１】　耐熱合金製金属箔の平箔と、同箔をコルゲート加工して形成した波箔を重ねて巻回すかあるいは交互に積層して構成したハニカム体と、それを収容する耐熱合金製外筒よりなる触媒コンバータ用メタル担体の製造方法において、ハニカム体の平箔と波箔の接合を拡散接合で行うにあたり、該金属箔の表面粗さを平均粗さ（Ｒａ）で０．００１μｍ以上０．２μｍ以下とすることを特徴とするメタル担体の製造方法。

【請求項２】　ハニカム体の接合を拡散接合で行うにあたり、前記平箔と波箔の接触幅が３０μｍ以上となる形状の波箔を用いる請求項１記載のメタル担体の製造方法。

【請求項３】　ハニカム体と外筒間の接合を拡散接合で行うにあたり、前記外筒内面の表面粗さを平均粗さ（Ｒａ）で０．００１μｍ以上０．２μｍ以下とする請求項１又は２記載のメタル担体の製造方法。

【請求項４】　ハニカム体を外筒に挿入し位置決めをした後、外筒と共に縮径する請求項１，２又は３記載のメタル担体の製造方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、自動車のエンジン等の内燃機関から排出される排ガスを浄化するための触媒コンバータ用メタル担体、特に拡散接合によるメタル担体の製造方法に関するものである。

【０００２】従来より自動車の排気ガスを浄化するための触媒コンバータにはセラミックス担体が使用されているが、耐熱性、低圧損および搭載性の点より、メタル担体の使用量が最近増加している。

【０００３】メタル担体１は図１にその外観を示すが、厚さ５０μｍ程度のステンレス鋼等の耐食、耐熱合金製の金属箔の平箔２と、平箔をコルゲート加工した波箔３とを重ねて巻回して、あるいは相互に積層してハニカム体４を形成し、ハニカム体４を外筒５に収納して形成されている。そしてこのメタル担体１は白金、パラジウム、ロジウム等の排ガス浄化用の触媒を担持された後、例えば自動車エンジンの排ガス系に搭載される。

【０００４】このメタル担体１は、エンジンからの高温の排ガスによる激しい熱サイクル、あるいはエンジンからの激しい振動を受けるため耐久性が重要視される。そこで耐久性を確保するため、メタル担体１は従来からハニカム体４の平箔２と波箔３との接合およびハニカム体４と外筒５との接合は、ロウ付け、抵抗溶接あるいは拡散接合で行われてきた。

【０００５】ここでいう拡散接合とは、ロウ材等を特別に用いることなく、高温高真空下あるいは非酸化性雰囲気下に保持することにより接合する方法である。拡散接合を実施する場合には、相互の接触部を接合する方法のため、特に平箔２と波箔３の接触部を確保することが重要である。

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【０００６】従来の拡散接合において、平箔２と波箔３の接触部を確保する方法として平箔２と波箔３間の接触面圧を高めることが言及されてきた。すなわちハニカム体４の形成時に、図２のように平箔２にバックテンションを矢印Ａの方向に掛けて、波箔３とともに矢印Ｂの方向に巻取り軸６の周りに巻回して、ハニカム体４を硬く巻き上げていた。更にそうしてできたハニカム体４を外筒５に挿入後、高真空下あるいは非酸化性雰囲気下で高温熱処理しメタル担体１を製作してきた。

【０００７】しかし、ハニカム体４の拡散接合組立に計算上必要な値のバックテンションを負荷すると、平箔２と波箔３を巻取る際に巻取り軸が変形する、あるいはそのバックテンションが偏重することにより平箔２が破断し、巻取り不能になるという問題が起きた。そこでバックテンションを抑えて巻取るために、特開平２－１４７４７号に示すようにハニカム体４を外筒５に挿入した後、外筒５と共にダイスで縮径し外層部から接触面圧を高める方法を試みた。しかし、縮径には変形を伴い一部波箔３の座屈が発生し、無制限に縮径できるものではないため十分な効果が得られなかった。

【０００８】

【発明が解決しようとする課題】本発明は、平箔にバックテンションを付与しながら、平箔をコルゲート加工した波箔と共に中心軸の周りに巻回しハニカム体を形成し、同ハニカム体を外筒に挿入し、一体的に縮径した後、真空あるいは非酸化性雰囲気下で拡散接合するメタル担体の製造方法において、ハニカム体の平箔と波箔の接合およびハニカム体と外筒の接合が不安定になる問題を解決するものである。

【０００９】

【課題を解決するための手段】本発明の要旨は（１）耐熱合金性の金属箔の平箔と、同箔をコルゲート加工して形成された波箔を重ねて巻回しあるいは交互に積層されたハニカム体と、それを収容する耐熱合金製外筒よりなる触媒コンバータ用メタル担体の製造方法において、ハニカム体の平箔と波箔の接合を拡散接合で行うにあたり、該金属箔の表面粗さを平均粗さ（Ｒａ）で０．００１μｍ以上０．２μｍ以下とするメタル担体の製造方法、

【００１０】（２）ハニカム体の接合を拡散接合で行うにあたり、平箔と波箔の接触幅が３０μｍ以上となる形状の波箔を用いる（１）記載のメタル担体の製造方法、（３）ハニカム体と外筒間の接合を拡散接合で行うにあたり、該外筒の内面の表面粗さを平均粗さ（Ｒａ）で０．００１μｍ以上０．２μｍ以下とする（１）又は（２）記載のメタル担体の製造方法、（４）ハニカム体を外筒に挿入し位置決めをした後、外筒と共に縮径する（１），（２）又は（３）記載のメタル担体の製造方法にある。

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【００１１】

【作用】触媒コンバータ用メタル担体で使用されるハニカム体を構成する厚さ５０μｍ程度の金属箔同士を拡散接合する場合、あるいは前記ハニカム体と外筒を拡散接合する場合には、接合すべき素材同士は互いに密着していなければならない。

【００１２】一般に、拡散接合においては、接合すべき材料に加熱接合中も終始面圧が加わるように加圧装置あるいはウェイトが使用される。しかしながら、メタル担体の場合は、その構造の特異性にもとづき外部から面圧を付与することができず、ハニカム体を形成するために金属箔同士を巻回すときに平箔にかける限られた張力のバックテンションあるいはハニカム体を外筒に挿入した後の縮径により得られる限られた面圧のもとで拡散接合を実施する必要がある。

【００１３】同一面圧のもとで拡散接合性を向上させる方法を探索した結果、ハニカム体の拡散接合組立において平箔および波箔の表面粗さを小さくすることが有効であることを発見した。実験結果によると平箔および波箔の平均粗さ（Ｒａ）が０．００１μｍ以上０．２μｍ以下で極めて容易に良好な拡散接合部が得られた。尚、金属箔の平均粗さの下限は０．００１μｍが好ましい。その理由はそれ以上平滑にしても拡散接合性に与える影響は飽和するからである。更に、外筒内面の平均粗さ（Ｒａ）が０．００１μｍ以上０．２μｍ以下のとき、ハニカム体と外筒材の拡散接合が容易に進行することを確認した。又、本発明の平箔および波箔の表面粗さを前記の範囲にするとともに、波箔の形状を例えば台形波箔の如く、平箔と波箔の接触幅を３０μｍ以上とすると、拡散接合性がより向上して好ましい。

【００１４】

【実施例】従来のメタル担体製造方法と本発明による場合とを、外径１００mm、長さ１００mmのメタル担体で比較した。下記は従来法と本発明によるメタル担体の共通仕様である。

平箔：フェライト系ステンレス箔、厚さ５０μｍ、幅１００mm

波箔：フェライト系ステンレス箔、厚さ５０μｍ、波高さ１．２５mm、ピッチ２．５４mm、幅１００mm

外筒：耐熱ステンレス鋼、板厚１．５mm、製品外径１００mm、長さ１００mm

【００１５】（１）従来法によるメタル担体Ⅰ

平箔と波箔：材質２０Ｃｒ－５Ａｌ、表面粗さ（Ｒａ）０．３μｍ

平箔と波箔の接触幅：２００μｍ

外筒：材質１８Ｃｒ－８Ｎｉ、表面粗さ（Ｒａ）０．３μｍ

平箔に１５kgf のバックテンションを加えながら、波箔と共に巻回し、外径９８．５mmのハニカム体を作成した。そのハニカム体を外径１０２mm、板厚１．５mmの外筒に挿入し、縮径機にて外径１００mmに縮径した。その後、１２５０℃、10^{-4} torrの高温高真空下で９０分加熱保持しメタル担体Ⅰを製作した。

【００１６】（２）本発明法によるメタル担体Ⅱ

平箔と波箔：材質２０Ｃｒ－５Ａｌ、表面粗さ（Ｒａ）０．２μｍ

平箔と波箔の接触幅：２００μｍ

外筒：材質１８Ｃｒ－８Ｎｉ、表面粗さ（Ｒａ）０．２μｍ

平箔に１５kgf のバックテンションを加えながら、波箔と共に巻回し、外径９８．５mmのハニカム体を作成した。そのハニカム体を外径１０２mm、板厚１．５mmの外筒に挿入し、縮径機にて外径１００mmに縮径した。その後、１２５０℃、10^{-4} torrの高温高真空下で９０分加熱保持しメタル担体Ⅱを製作した。

【００１７】（３）本発明法によるメタル担体Ⅲ

平箔と波箔：材質２０Ｃｒ－５Ａｌ、表面粗さ（Ｒａ）０．１μｍ

平箔と波箔の接触幅：２００μｍ

外筒：材質１８Ｃｒ－８Ｎｉ、表面粗さ（Ｒａ）０．１μｍ

平箔に１５kgf のバックテンションを加えながら、波箔と共に巻回し、外径９８．５mmのハニカム体を作成した。そのハニカム体を外径１０２mm、板厚１．５mmの外筒に挿入し、縮径機にて外径１００mmに縮径した。その後、１２５０℃、10^{-4} torrの高温高真空下で９０分加熱保持しメタル担体Ⅲ を製作した。

【００１８】（４）本発明法によるメタル担体Ⅳ

平箔と波箔：材質２０Ｃｒ－５Ａｌ、表面粗さ（Ｒａ）０．０１μｍ

平箔と波箔の接触幅：２００μｍ

外筒：材質１８Ｃｒ－８Ｎｉ、表面粗さ（Ｒａ）０．０５μｍ

平箔に１５kgf のバックテンションを加えながら、波箔と共に巻回し、外径９８．５mmのハニカム体を作成した。そのハニカム体を外径１０２mm、板厚１．５mmの外筒に挿入し、縮径機にて外径１００mmに縮径した。その後、１２５０℃、10^{-4} torrの高温高真空下で９０分加熱保持しメタル担体Ⅳを製作した。

【００１９】（５）本発明法によるメタル担体Ⅴ

平箔と波箔：材質２０Ｃｒ－５Ａｌ、表面粗さ（Ｒａ）０．００１μｍ

平箔と波箔の接触幅：２００μｍ

外筒：材質１８Ｃｒ－８Ｎｉ、表面粗さ（Ｒａ）０．０１μｍ

平箔に１５kgf のバックテンションを加えながら、波箔と共に巻回し、外径９８．５mmのハニカム体を作成した。そのハニカム体を外径１０２mm、板厚１．５mmの外筒に挿入し、縮径機にて外径１００mmに縮径した。その後、１２５０℃、10^{-4} torrの高温高真空下で９０分加

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熱保持しメタル担体Ｖを製作した。

【００２０】（６）本発明法によるメタル担体VI

平箔と波箔：材質２０Ｃｒ－５Ａｌ、表面粗さ（Ｒａ）０．１μｍ

平箔と波箔の接触幅：３０μｍ

外筒：材質１８Ｃｒ－８Ｎｉ、表面粗さ（Ｒａ）０．１μｍ

平箔に１５kgf のバックテンションを加えながら、波箔と共に巻回し、外径９８．５mmのハニカム体を作成した。そのハニカム体を外径１０２mm、板厚１．５mmの外筒に挿入し、縮径機にて外径１００mmに縮径した。その後、１２５０℃、10^{-4} torrの高温高真空下で９０分加熱保持しメタル担体VIを製作した。

【００２１】（７）従来法によるメタル担体VII

平箔と波箔：材質２０Ｃｒ－５Ａｌ、表面粗さ（Ｒａ）０．１μｍ

平箔と波箔の接触幅：２０μｍ

外筒：材質１８Ｃｒ－８Ｎｉ、表面粗さ（Ｒａ）０．３μｍ

平箔に１５kgf のバックテンションを加えながら、波箔と共に巻回し、外径９８．５mmのハニカム体を作成した。そのハニカム体を外径１０２mm、板厚１．５mmの外筒に挿入し、縮径機にて外径１００mmに縮径した。その後、１２５０℃、10^{-4} torrの高温高真空下で９０分加熱保持しメタル担体VII を製作した。

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＊【００２２】上記メタル担体Ｉ，II，III，IV，Ｖを樹脂に埋め込み研磨後、外周から２０層分のハニカム体の接合率を調査した。その結果を表１に示す。さらにハニカム体と外筒の接合率を調査した。その結果を表２に示す。従来法に対し本発明の方法によれば拡散接合を安定して行うことができ、良好な拡散接合メタル担体を得ることができた。

【００２３】上記メタル担体III，VI，VII を切断し平箔と波箔のピール試験を実行した（ピール試験は平箔と波箔の接合率の簡易測定法であり、箔をペンチで引き剥がし、接合点から剥れたものを不良、接合点以外の母材部で剥がれたものを合格とした）。その結果、本発明のIII，VIにおいては拡散接合部を残したまま平箔で破断し、従来法のVII においては拡散接合部で破断した。従来法に対し本発明の方法によれば拡散接合を安定して行うことができ、良好な拡散接合メタル担体を得ることができた。

【００２４】本発明による拡散接合メタル担体II，III，IV，Ｖ，VIをガソリンエンジンの排気系に搭載し、１サイクル：加熱９００℃×１０分＋冷却１５０℃×１０分の耐久試験を９００サイクル実施したところ総て合格した。

【００２５】

【表１】

＊

	従来法	本発明による方法		
	メタル担体 I	メタル担体 II	メタル担体 III	メタル担体 IV
接合点数／全接点数	０．５５	０．８７	０．９５	０．９８

【００２６】

【表２】

	従来法	本発明による方法		
	メタル担体 I	メタル担体 II	メタル担体 III	メタル担体 IV
接合点数／全接点数	０．２５	０．７５	０．９０	０．９７

【００２７】

【発明の効果】以上のように本発明によると、メタル担体の平箔と波箔の拡散接合そして外筒とハニカム体の拡散接合を良好に行うことができるので、実用に耐えるメタル担体を製作することができる。

【図面の簡単な説明】

【図１】メタル担体を示す斜視図である。

【図２】ハニカム体の巻取り状態を示す斜視図である。

【符号の説明】

１…メタル担体

２…平箔

３…波箔

４…ハニカム体

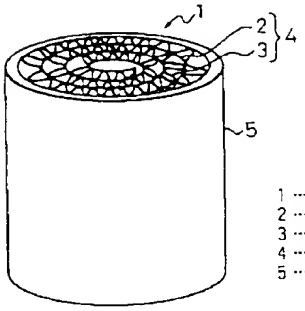
５…外筒

６…巻取り軸

Ａ…バックテンションの方向を示す矢印

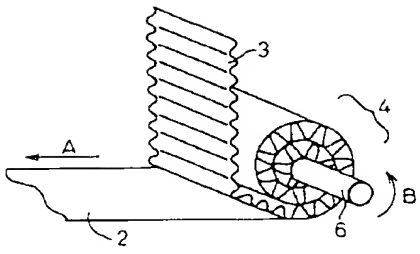
Ｂ…ハニカム体巻取り方向を示す矢印

【図１】



1…メタル担体
2…平箔
3…波箔
4…ハニカム体
5…外筒

【図２】



6…巻取り軸
A…バックテンションの方向を示す矢印
B…ハニカム体巻取り方向を示す矢印